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(54) **An electrical connector**

(57) An electrical connector comprises a housing with a plurality of terminal-receiving cavities (16) formed therein and an insulation-displacement type terminal mounted in each cavity for receiving a wire moved laterally of its axis into the cavity. Wire retaining means are formed on the housing associated with each cavity (16), the said means comprising a flexible wire-retaining finger (30) which is of such a length as to extend across the wire-receiving slot (20) of the respective terminal so that it overlies more than half of the respective cavity, and a limit means (28) which co-operates with the resilient finger (30) for limiting the resilient travel thereof in a direction outwardly of the cavity.

FIG. 3

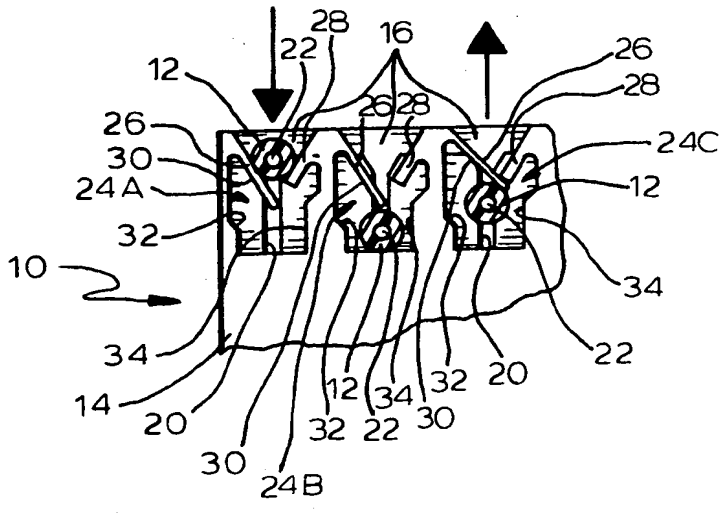

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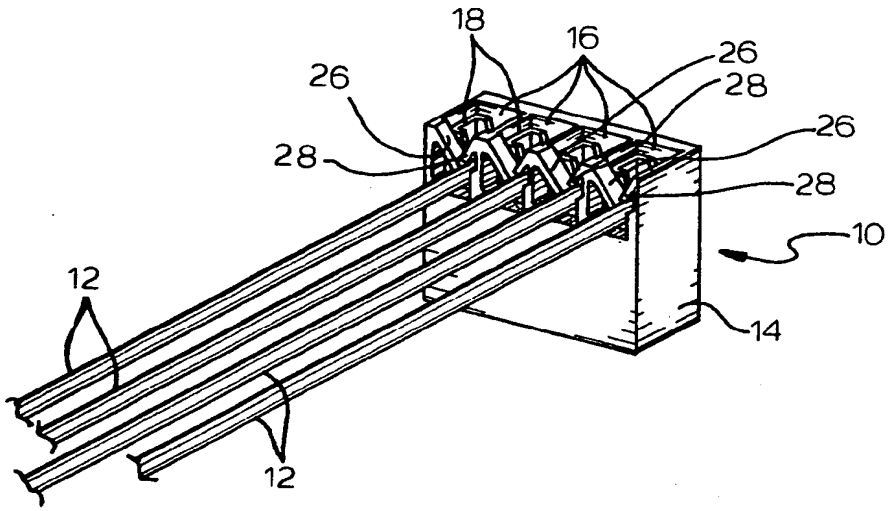
FIG. 1



PRIOR ART

FIG. 2

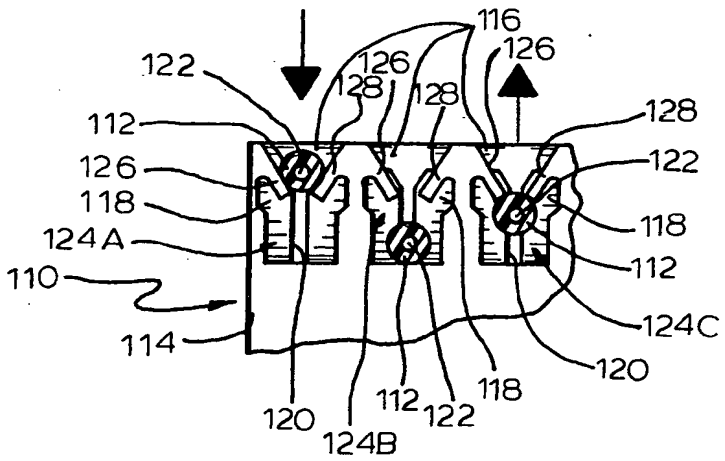
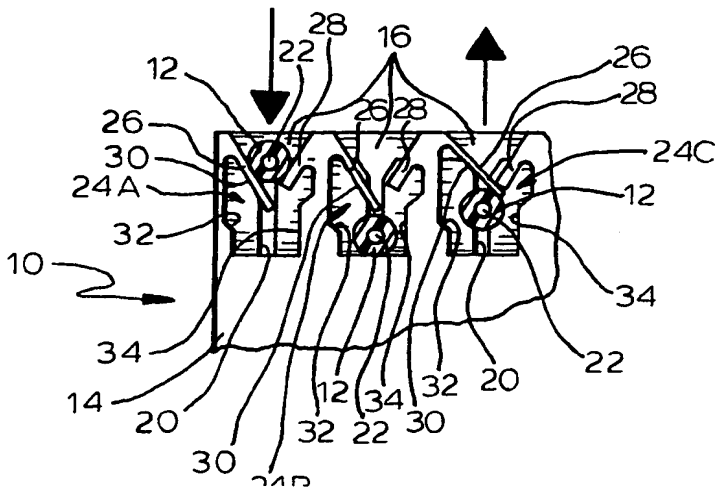


FIG. 3



SPECIFICATION

Improvements relating to electrical connectors

The present invention generally relates to electrical connectors and, in particular, to electrical connectors having means to inhibit the accidental removal of a wire connected thereto.

Electrical connectors adapted to have wires connected thereto are known in which retaining means are provided to inhibit the accidental pullout of a wire which has been received and connected to the connector. An example of a connector of this general type is disclosed in United States Patent No. 4,191,442.

In United States Patent No. 4,191,442, the connector generally includes an insulated housing with a terminal receiving cavity formed therein and a wire connecting region adjoining the cavity for receiving a wire moved laterally of its axis into the cavity. A terminal having a wire connecting portion adapted to be electrically connected to the conductor portion is mounted in the cavity. So-called strain relief means is formed on the housing adjacent the wire connecting portion of the terminal for inhibiting wire pullout.

One form of strain relief means that is disclosed in United States Patent No. 4,191,442 comprises a flexible wire-retaining finger extending into the wire connecting region to define a constricted wire receiving entrance. The finger is resiliently movable to allow a wire to pass through the entrance into the cavity for connection to the terminal.

While the strain relief structure disclosed in the United States Patent No. 4,191,442 may provide a suitable means of preventing an accidental pullout of the wires from the terminals in some applications, the configuration disclosed will not prevent an accidental disconnection if there is a sufficient force applied on the wire. Accordingly, in these types of applications, the strain relief means disclosed in United States Patent No. 4,191,442 is inadequate.

The present invention resides in the concept of providing a retaining finger or the like which extends across the path of movement of a wire into the wire connecting portion of a terminal received in a recess of the connector housing, the finger being resiliently movable out of said path with such movement so as to permit entry of the wire into the wire connecting portion of the terminal, but being limited as regards movement in the opposite direction so as to inhibit withdrawal of the wire once inserted.

In one form of the invention currently contemplated, the electrical connector includes an insulated housing with a terminal receiving cavity formed therein and a wire connecting region adjoining said cavity for receiving a wire moved laterally of its axis into the cavity, a terminal having a wire connecting portion adapted to be electrically connected to said connector portion mounted in the cavity, and strain relief means formed on the housing adjacent the wire connecting portion of the terminal, said strain relief means including at least one flexible wire-retaining finger extending into the wire connecting region and defining a constricted wire-receiving entrance therefor, said finger being resiliently movable to allow a wire to pass through said entrance into the cavity and being of such length that the free end thereof is disposed past the centerline of said region and a surface thereof facing inwardly of the cavity overlies more than half of said cavity to define a wire stop, and limit means formed on and extending from a side of the cavity spaced from and overlying the finger for limiting the resilient travel thereof in a direction away from said cavity.

In order that the invention might be clearly understood, an exemplary embodiment thereof will hereinafter be described with reference to the accompanying drawings wherein:-

Figure 1 is a perspective view of an embodiment of the present invention having wires connected thereto;

Figure 2 is an enlarged fragmentary side elevational view showing a prior art connector having several wire connecting regions, each region having a wire in a different position; and

Figure 3 is an enlarged fragmentary side elevational view similar to Figure 2 but showing the connector of the present invention.

Referring to the figures, Figure 1 illustrates a connector assembly, generally designated 10, according to the present invention having a plurality of insulation clad wires 12 connected thereto. The connector 10 generally includes an electrically insulated housing 14 having a plurality of discrete terminal-receiving cavities 16 formed therein. Within each cavity 16, an insulation-displacement type terminal 18 is mounted, each terminal having a wire-receiving slot 20 formed therein to displace the insulation on the wire 12 and electrically contact the central conductor portion 22 thereof.

In order to best illustrate and describe the advantages of the connector 10 of the present invention over the prior art, Figures 2 and 3 are provided for comparison. Figure 2 shows a connector 110 of a type that is known in the prior art, and Figure 3 shows a connector 10 embodying the present invention and having a new and improved wire retaining or strain relief means which will be discussed in greater detail hereinafter.

For ease of discussion, the reference numerals of the analogous parts of the prior art connector 110 shown in Figure 2 shall have the same last two digits as the connector 10 of the present invention shown in Figures 1 and 3, but shall be preceded by a "1".

Turning now to Figure 2, the fragmentary portion of the prior art connector 110 that is illustrated has three wire-connecting regions 124A, 124b and 124C. Each of these regions 124A, 124B and 124C adjoins a respective terminal-receiving cavity 116 for receiving a wire 112 that is moved laterally of its axis into the cavity.

The wire retaining means of the prior art connector 110 shown in Figure 2 generally includes two flexible wire-retaining fingers 126 and 128 extending from opposite sides of the cavity into each of the wire-connecting regions 124A, 124B and 124C. The space between the ends of each pair of wire-retaining fingers 126 and 128 defines a constricted wire-receiving entrance having a width less than the

diameter of the wire 112. The fingers 126 and 128 are resiliently movable to allow each wire 112 to pass through the entrance into the respective cavity 116 for mating with its respective terminal 118.

Turning now to Figure 3 in greater detail, the fragmentary portion of the connector 10 of the present invention is seen to include three wire-connecting regions, 24A, 24B and 24C which adjoin the respective cavities 16 for receiving a wire 12 moved laterally of its axis into the cavity.

The wire retaining means of the connector of the present invention 10 is seen generally to include a flexible wire-retaining finger 26 extending into each of the wire connecting regions 24A, 24B and 24C. Each wire-retaining finger 26 is of such length that the free end thereof is disposed past the centerline of its respective region. A surface 30 of the retaining finger 26 faces inwardly of the cavity 16 and overlies more than half of the cavity to define a wire stop.

A limit means in the form of a thicker, less resilient finger 28 extends from a side of each cavity 16 opposite the resilient finger 26 and is spaced from and overlies finger 26 for the purpose of limiting the resilient travel of finger 26 in a direction away from the cavity.

A wire receiving entrance in the form of a slanted passageway is defined between each pair of fingers 26 and 28. Each finger 26 is resiliently movable toward the respective cavity 16 to allow a wire 12 to pass through the entrance into the cavity.

The side 32 of each cavity 16 from which the resilient finger 26 extends is formed in a ramp-like manner as compared to the opposite side 34 to guide the wire toward side 32. This ensures that a wire 12 which has an outward force applied to it abuts against the stop surface 30.

Looking at both Figures 2 and 3, one can appreciate the advantages of the connector 10 of the present invention as illustrated in Figure 3. In particular, the prior art connector 110 shown in Figure 2 has each wire receiving entrance coincident with the centerline of each cavity 116 and of each wire 112 received therein. Accordingly, if an upward force is applied to wire 112 in region 124C, the wire can pass through the wire receiving entrance in a direction opposite that of insertion.

On the other hand, looking at Figure 3, and in particular at wire connecting region 24C, when an upward force is applied to wire 12, the wire abuts the stop surface 30. This is because the finger 26 extends across the centerline of the cavity 16. Further upward motion of the wire 12 beyond the position shown in region 24C is restrained on account of the upward travel of the resilient finger 26 being limited or stopped by finger 28.

With respect to the connector 10 of the present invention, it would take a larger upward force applied to wire 12 in order to cause an accidental disconnection of the conductor portion 22 thereof from its respective terminal 18. It has been found that the magnitude of upward force required to disconnect a wire 12 in the manner described is approximately four times as high for the connector according to the invention as for the prior art connector 110 illustrated in Figure 2.

CLAIMS

1. An electrical connector for electrically connecting the conductor portion of a wire to another circuit element, said connector including:

an electrically insulated housing with a terminal-receiving cavity formed therein and a wire connecting region adjoining said cavity for receiving a wire moved laterally of its axis into the cavity;

a terminal mounted in the cavity and having a wire-connecting portion adapted for making electrical connection with said conductor portion; and

strain relief means formed on the housing adjacent the wire-connecting portion of the terminal;

said strain relief means including at least one flexible wire-retaining finger extending into the wire-connecting region and defining a constricted wire-receiving entrance thereof, said finger being resiliently movable to allow a wire to pass through said entrance into the cavity and being of such length that the free end thereof is disposed past the centerline of said region and a surface thereof facing inwardly of the cavity overlies more than half of said cavity to define a wire stop, and limit means formed on and extending from a side of the cavity spaced from and overlying the finger for limiting the resilient travel thereof in a direction away from said cavity.

2. A connector as claimed in claim 1, wherein said limit means extends from a side of the cavity opposite the finger and wherein said wire receiving entrance is a slanted passageway defined between said limit means and said wire.

3. A connector as claimed in claim 1 or 2 including guide means formed on the cavity to guide a wire toward the wire stop surface when an outward force is applied to a wire connected to the terminal.

4. A connector as claimed in claim 1, 2 or 3, wherein said terminal includes a wire receiving slot capable of displacing insulation on a wire and electrically contacting the conductor portion thereof.

5. An electrical connector adapted for receiving a conductor moved transversely of the length thereof into a recess in the connector housing wherein a terminal is mounted for contacting the conductor, and wherein a conductor-retaining member extends into the path of insertion of the conductor into the recess, said member being resiliently biassable out of said path by the conductor during its insertion so as to permit entry of the conductor past the said member and into the recess, but being limited as regards movement in the opposite direction so as to inhibit withdrawal of the conductor once inserted.

6. An electrical connector substantially as herein described with reference to Figures 1 and 3 of the accompanying drawings.

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